

EXERCISES

For more practice, see *Extra Practice*.

Practice and Problem Solving

A Practice by Example

Example 1 (page 44)

Find the distance between the points to the nearest tenth.

1. $J(2, -1), K(2, 5)$
2. $L(10, 14), M(-8, 14)$
3. $N(-1, -11), P(-1, -3)$
4. $A(0, 3), B(0, 12)$
5. $C(12, 6), D(-8, 18)$
6. $E(6, -2), F(-2, 4)$
7. $Q(12, -12), T(5, 12)$
8. $R(0, 5), S(12, 3)$
9. $X(-3, -4), Y(5, 5)$

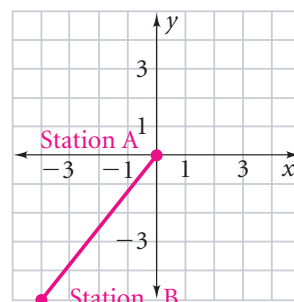
Example 2 (page 44)

Use the map in Example 2 on page 44. Find the distance between the stations.

10. North and South
11. Oak and Symphony
12. City Plaza and Cedar

Use the map at the right. Find the distances between the stations to the nearest tenth.

13. Station A and Station B
14. Station B and Station C located at $(5, 8)$
15. Station B and Station D located at $(1, 10)$
16. Station E at $(2, 12)$ and Station F at $(5, 16)$
17. List the stations B, C, D, E, and F in the order of least to greatest distance from Station A.



Example 3 (page 45)

Find the coordinates of the midpoint of \overline{HX} .

18. $H(0, 0), X(8, 4)$
19. $H(-1, 3), X(7, -1)$
20. $H(13, 8), X(-6, -6)$
21. $H(7, 10), X(5, -8)$
22. $H(-6.3, 5.2), X(1.8, -1)$
23. $H(5\frac{1}{2}, -4\frac{3}{4}), X(2\frac{1}{4}, -1\frac{1}{4})$

Example 4 (page 45)

The coordinates of point T are given. The midpoint of \overline{ST} has coordinates $(5, -8)$. Find the coordinates of point S .

24. $T(0, 4)$
25. $T(5, -15)$
26. $T(10, 18)$
27. $T(-2, 8)$
28. $T(1, 12)$
29. $T(4.5, -2.5)$

An endpoint and a midpoint are given. Find the coordinates of the other endpoint.

30. endpoint $(2, 6)$, midpoint $(5, 12)$
31. endpoint $(2, 3)$, midpoint $(3, -4)$

B Apply Your Skills

Find (a) PQ to the nearest tenth and (b) the coordinates of the midpoint of \overline{PQ} .

32. $P(3, 2), Q(6, 6)$
33. $P(0, -2), Q(3, 3)$
34. $P(-4, -2), Q(1, 3)$
35. $P(-5, 2), Q(0, 4)$
36. $P(-3, -1), Q(5, -7)$
37. $P(-5, -3), Q(-3, -5)$
38. $P(-4, -5), Q(-1, 1)$
39. $P(2, 3), Q(4, -2)$
40. $P(4, 2), Q(3, 0)$

41. The midpoint of \overline{TS} is the origin. Point T is located in Quadrant II. What quadrant contains point S ?
42. Graph the points $A(2, 1), B(6, -1), C(8, 7)$, and $D(4, 9)$. Draw quadrilateral $ABCD$. Use the Midpoint Formula to find the midpoints of \overline{AC} and \overline{BD} . What appears to be true?



Need Help?

In Exercise 43, you can compare lengths in radical form and not need a calculator.

43. The coordinates of S , T , V , and W are given below. Graph the points and draw segments to join them in order. Draw \overline{WS} . Are the lengths of the four sides of quadrilateral $STVW$ the same? Show your work.

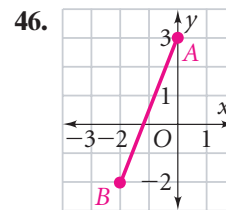
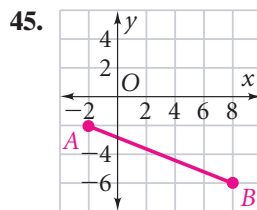
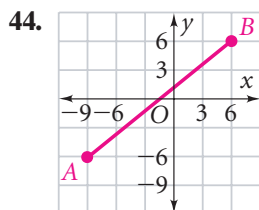
$S(-6, 2)$

$T(-3, 5)$

$V(-6, 6)$

$W(-9, 5)$

For each graph, find (a) AB to the nearest tenth and (b) the coordinates of the midpoint of \overline{AB} .



47. **Navigation** A boat at $X(5, -2)$ needs to travel to $Y(-6, 9)$ or $Z(17, -3)$. Which point is closer? What is the distance to the closer point?



48. **Writing** An airplane at $T(80, 20)$ needs to fly to both $U(20, 60)$ and $V(110, 85)$. What is the shortest possible distance for the trip? Explain.



Communications The cell phone screen at the right shows coordinates of six cities from a grid placed on North America by a long-distance carrier. The carrier finds distance by the Distance Formula. Each grid unit equals $\sqrt{0.1}$ mile. Find the distance between each pair of cities to the nearest mile.



SOURCE: Peter H. Dana

49. Houston and Chicago
50. Denver and New Orleans
51. Boston and San Francisco
52. New Orleans and Houston

Graph $X(-2, 1)$, $Y(2, 3)$, $A(-1, 4)$, $B(0, 2)$, and $C(4, 2)$. For each point described below, give two sets of possible coordinates if they exist. Otherwise, write *exactly one point* and give the coordinates, or *not possible* and explain.

53. point D so that $\overrightarrow{AD} \parallel \overrightarrow{XY}$

54. E so that $\overrightarrow{EC} \parallel \overrightarrow{XY}$

55. point F so that $\overrightarrow{FB} \perp \overrightarrow{XY}$

56. point G so that $\overrightarrow{GC} \perp \overrightarrow{XY}$

57. point H so that $\overrightarrow{HX} \parallel \overrightarrow{AY}$, and $\overrightarrow{HA} \parallel \overrightarrow{XY}$

58. point J so that $\overrightarrow{JB} \perp \overrightarrow{XY}$, and $\overrightarrow{JC} \perp \overrightarrow{CY}$



Challenge

59. **Open-Ended** In a coordinate plane, draw any \overline{AB} . Draw another segment that is both congruent and parallel to \overline{AB} . Label the new segment \overline{CD} in such a way that $ABCD$ is a quadrilateral.
- Find BC and AD . What do you notice?
 - Write a conjecture that generalizes the result you found in part (a).
 - Find the midpoint of \overline{AC} and the midpoint of \overline{BD} . What do you notice?
 - Write a conjecture that generalizes the result you found in part (c).
 - Find the midpoint E of \overline{AD} and the midpoint F of \overline{BC} . Find EF and AB . What do you notice?
 - Write a conjecture that generalizes the result you found in part (e).

Geometry in 3 Dimensions You can use three coordinates (x, y, z) to locate points in three dimensions. Point P has coordinates $(6, -3.5, 9)$.

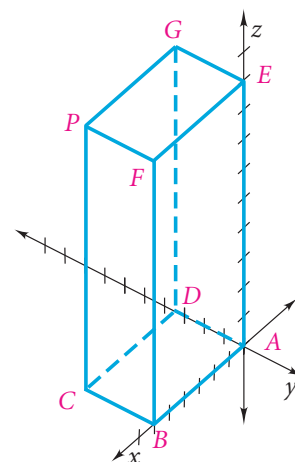
60. Give the coordinates of points A, B, C, D, E, F and G .
61. Draw three axes like those shown. Then graph $R(4, 5, 9)$.

Distance in 3 Dimensions In a three-dimensional coordinate system, the distance between two points (x_1, y_1, z_1) and (x_2, y_2, z_2) can be found using this extension of the Distance Formula.

$$d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2 + (z_2 - z_1)^2}$$

Find the distance between each pair of points to the nearest tenth.

62. $P(2, 3, 4), B(-2, 4, 9)$ 63. $Q(0, 12, 15), Y(-8, 20, 12)$



Standardized Test Prep

Multiple Choice

64. What are the coordinates of the point that is halfway between $(4, 1)$ and $(-22, 8)$?
- A. $(-9, 3.5)$ B. $(-9, 4.5)$ C. $(-18, 9)$ D. $(13, 4.5)$
65. Which point lies the farthest from the origin?
- F. $(0, -7)$ G. $(5, 1)$ H. $(-4, -3)$ I. $(-3, 8)$

Quantitative Comparison

Compare the boxed quantity in Column A with the boxed quantity in Column B. Choose the best answer.

- A. The quantity in Column A is greater.
 B. The quantity in Column B is greater.
 C. The two quantities are equal.
 D. The relationship cannot be determined from the information given.

Column A

Column B

- | | |
|---|---|
| 66. distance from $(2, -3)$ to $(0, 19)$ | distance from $(-12, 6)$ to $(-4, -10)$ |
| 67. distance from $(-31, -17)$ to $(-23, -16)$ | distance from $(8, 0)$ to $(0, -1)$ |
| A segment has endpoints at $(14, -5)$ and $(6, 14)$. | |
| 68. the x-coordinate of the midpoint of the segment | the y-coordinate of the midpoint of the segment |



Take It to the NET

Online lesson quiz at www.PHSchool.com

Web Code: afa-0106

Short Response

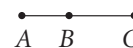
69. a. Points $P(-4, 6)$, $Q(2, 4)$, and R are collinear. One of the points is the midpoint of the segment formed by the other two points. What are the possible coordinates of R ?
- b. $RQ = \sqrt{160}$. Does this information affect your answer to part (a)? Explain.

Mixed Review

Lesson 1-5 Use a straightedge and compass.

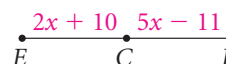
70. Draw \overline{AB} . Construct \overline{PQ} so that $PQ = 2AB$.
71. Draw \overline{LK} . Construct the perpendicular bisector of \overline{LK} .
72. Draw an obtuse $\angle B$. Construct $\angle C$ so that $m\angle C = m\angle B$.
73. Draw an acute $\angle RTS$. Construct the bisector of $\angle RTS$.

Lesson 1-4 x^2 74. **Algebra** The length of \overline{AC} is 45. If $AB = x + 8$ and $BC = 3x - 3$, find the value of x .

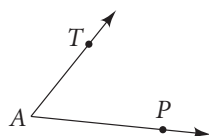


75. Find AB if the coordinate of A is 5 and the coordinate of B is -5 .

x^2 76. **Algebra** C is the midpoint of \overline{EF} . Find EF .



77. Name $\angle A$ two other ways.



78. $m\angle PQR = 60$. What is $m\angle RQS$?

